Elementary particles and time.

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Each elementary particle is an individual clock. Consider the definition of a clock given by Einstein [1]:

"...At the same time, we call a clock a system that automatically repeats the same process...".

This means that each elementary particle is a kind of clock. That is, every elementary particle in the Universe has its own clock...

…these are the oscillations of elementary particles according to de Broglie.

According to Louis de Broglie, for the electron there is a certain periodic process that occurs with a frequency γ [2]:

“In quantum theory, I assumed that there is a periodic process associated with the electron as a whole (the material point). This process for an observer stationary relative to an electron would occur over the whole space with the same phase and would have a frequency γ... ".

Moreover, the duration of this periodic process will be equal to:

$$E = h * \gamma = m * c^2$$

$$\gamma = (m * c^2) / h$$

$$\Delta t0 = 1 / \gamma = h / (m * c^2)$$

We especially note that the duration of the oscillation Δt0 is a fundamental characteristic of an elementary particle. It is because of this oscillation, which has a duration Δt0, that we observe and experimentally can register waves of matter, that is, de Broglie waves. Moreover, the de Broglie wavelength will be determined only by the speed of an elementary particle v in the selected frame of reference.

$$\lambda = h / (m * v)$$

Obviously, this oscillatory process will be observed in all elementary particles. But more importantly, every elementary particle in the universe has its own individual clock. That is, each elementary particle itself keeps track of time in the Universe, and therefore is an independent inertial frame of reference.

It is also obvious that the own clock of elementary particles will play an important role in their interactions with each other. And the interaction of all elementary particles with each other is the basis of all interactions in the Universe.

1. Einstein A. Collected Scientific Works. Vol. 1. Moscow, Nauka, 1965, p. 416.
2. Louis de Broglie. Selected Works. Volume 1. The formation of quantum physics: the work of 1921 - 1934. Moscow, Logos, 2010, p. 203 (About frequency of the electron).